Whitman (R.)

Observations on Bending of the Neck of the Femur in Adolescence, with Particular Reference to the Diagnosis and Significance of the Affection.

BY

ROYAL WHITMAN, M. D., M. R. C. S.,

Clinical Instructor in Orthopædic Surgery in the College of Physicians and Surgeons, New York;
Lecturer on Orthopædic Surgery at the N. Y. Polyclinic.

REPRINTED FROM THE

New York Medical Journal

for June 23, 1894.

57

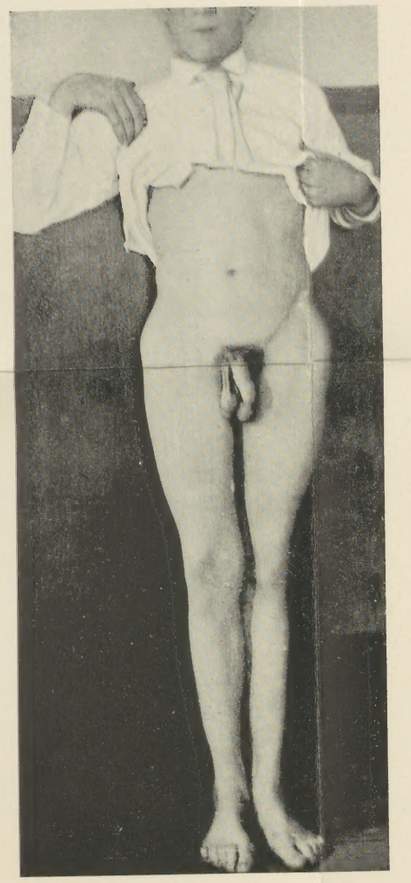

Fig. 7.

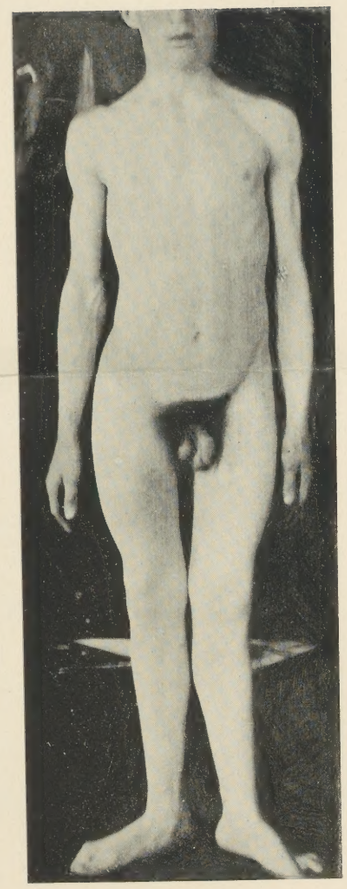

Fig. 8.

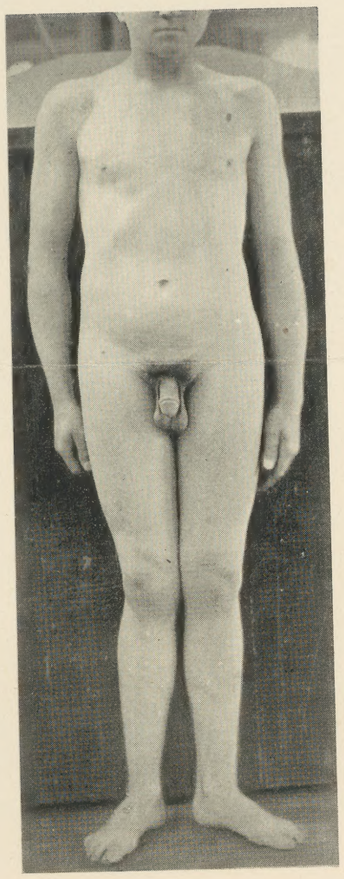

Fig. 9.

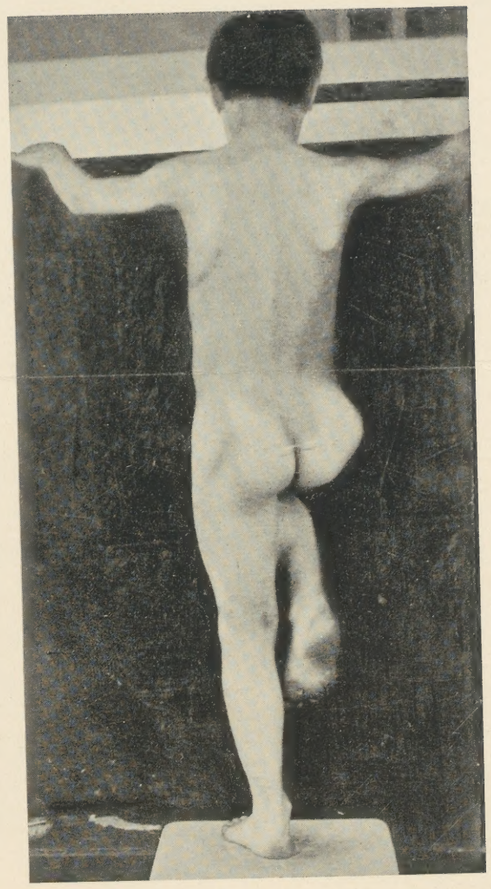

Fig. 10.

Fig. 7.—Photograph of Case II, September, 1893. Shows the prominent trochanters.

Fig. 8.—Photograph of Case II, May, 1894. Shows the apparent shortening of the legs relative to the length of the body as contrasted with Fig. 7.

Fig. 9.—Photograph of Case III, March, 1894. Shows the slight prominence in the left trochanteric region, the slight tilting of the pelvis, and the knock-knee on the opposite side.

Fig. 10.—Photograph of Case IV, March, 1894. Shows the prominent trochanter on the right side, and especially the effect of flexion of the thigh in increasing the deformity.

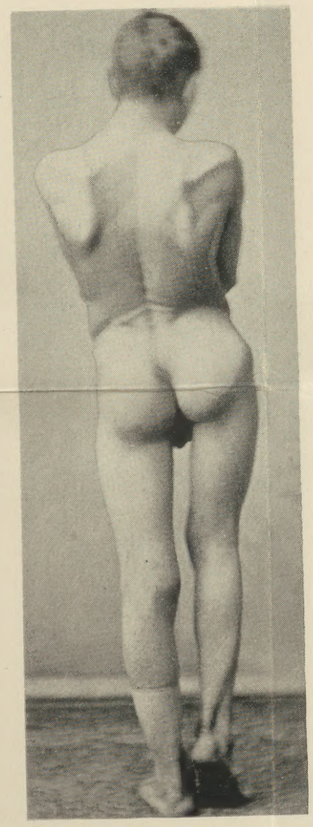

Fig. 3.

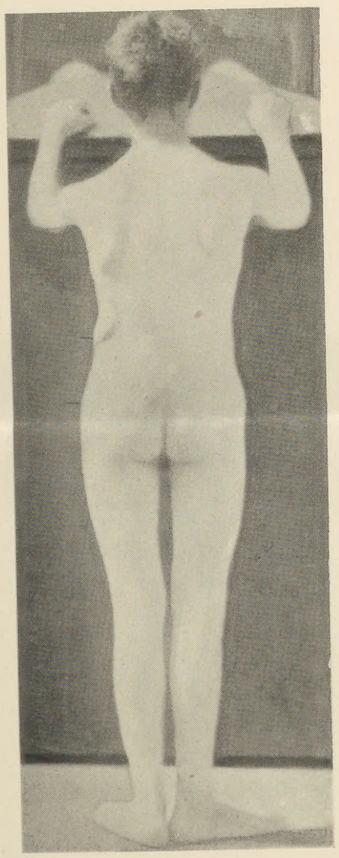

Fig. 4.

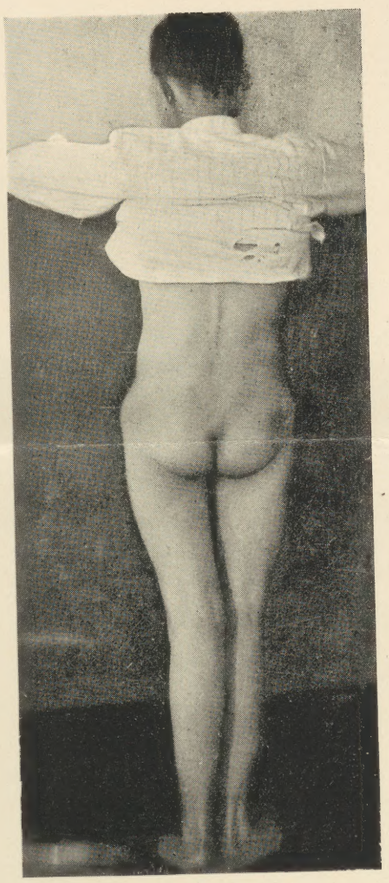

Fig. 5.

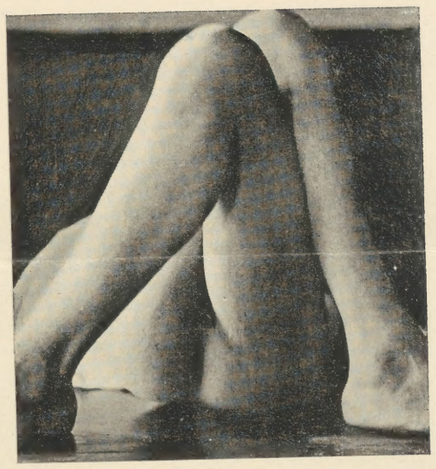

Fig. 6.

Fig. 3.—Photograph of Case I, April, 1894. Shows the apparent shortening of the right leg, the prominence of the trochanter, the adduction and compensatory tilting of the pelvis.

Fig. 4.—Photograph of Case II, June, 1893.

Fig. 5.—Photograph of Case II, September, 1893. Shows, when contrasted with Fig. 4, the relative prominence and elevation of the trochanters, also the absence of the normal lumbar lordosis.

Fig. 6.—Photograph of Case II, September, 1893. Shows the involuntary crossing of the legs in flexing the thighs on the body.

Reprinted from the New York Medical Journal
for June 23, 1894.

OBSERVATIONS ON BENDING OF THE NECK OF THE FEMUR IN ADOLESCENCE,

WITH PARTICULAR REFERENCE TO THE DIAGNOSIS AND SIGNIFICANCE OF THE AFFECTION.*

By ROYAL WHITMAN, M. D., M. R. C. S.,
CLINICAL INSTRUCTOR IN ORTHOPÆDIC SURGERY IN THE COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK; LECTURER ON ORTHOPÆDIC SURGERY AT THE NEW YORK POLYCLINIC.

It is proposed in this paper to call attention to a deformity at the hip joint that develops in adolescence under the same conditions as the other more familiar deformities of the lower extremity, most often in those who, at a period of rapid growth, of weakness and instability of the bones, are subjected to overwork or strain by occupations that require long standing or the carrying of heavy weights.

In this sense overwork is a relative term, since only a small proportion of individuals in a particular occupation break down, while similar deformities may appear in those who have not been subjected to these exciting causes. In many instances, therefore, one must recognize predisposing causes to satisfactorily explain a given deformity—such as the assumption of improper attitudes; or an inherited predisposition to deformity; or actual weakness of structure, either general or local; or slight deformities acquired in childhood, the effect of weakness or rhachitis, or of injury

* Read before the American Orthopædic Association, at Washington, May, 1894.

or disease, which increase under favorable conditions in later life.

The effect of this disproportion between the work to be performed and the strength of the supporting structures is most often seen in the member subjected to greatest strain in the production of flat-foot, which, indeed, may develop at any age and under a great variety of conditions; less frequently in distortion at the knee, and far less often in bending of the neck of the femur, which may or may not be associated with the preceding deformities.

The symptoms of this type of progressive deformity of the lower extremity in adolescence vary according to the function of the joint affected, the rate of progress, the extent and duration of the deformity, the secondary changes induced, and their effect upon the gait and posture of the individual; but, in general, they are weakness, awkwardness, local pain on exertion, and stiffness in the affected joint in changing from a period of rest to activity.

It is the pain of flat-foot, not the deformity, which impresses the patient. At the knee joint it is the deformity, not the pain or disability, for which advice is asked, and in the analogous deformity at the hip it is often the disability, rather than pain or deformity, that attracts attention.

It is only in very recent years that an affection so common as flat-foot has been generally recognized or treated by physicians, and it is therefore not strange that a comparatively rare condition, in a joint so deeply seated and concealed by overlying muscles, has attracted so little notice.

In 1889 E. Müller* reported four cases of bending of the neck of the femur as a new type of disease, of which the symptoms were presented as follows:

In adolescence, without apparent cause or following slight injury, the patient begins to limp and to complain of fatigue and pain about the affected joint on exertion. Shortening of the limb is soon apparent, and is caused by elevation of the trochanter above Nélaton's line. The limb is usually slightly rotated outward, extended, or slightly

* Ueber die Verbiegung des Schenkelhalses im Wachsthumsalter. Ein neues Krankheitsbild. *Beiträge zur klin. Chir.*, 1889, Bd. iv, S. 137–148.

flexed. The motion of the joint is somewhat limited, particularly in abduction; there is no local swelling or tenderness on pressure.

The ages of the patients reported were sixteen, seventeen, eighteen, and nineteen years, and in all the deformity was on one side only.

A specimen of the deformity was in one case obtained by resection. The joint surfaces were found to be perfectly normal; the neck of the bone was depressed to a right angle with the shaft (Fig. 1). Section showed no evidence

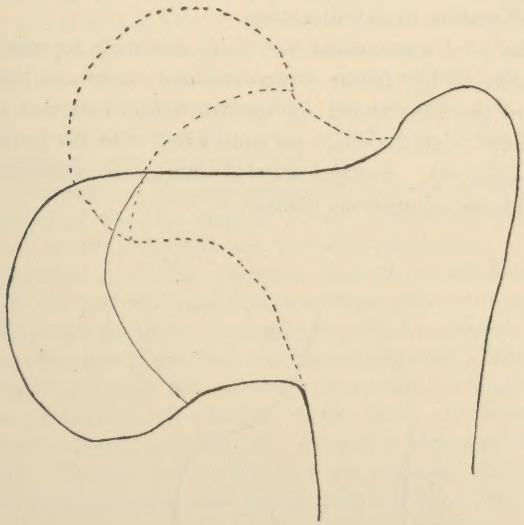

FIG. 1.—Outline of the depressed neck of the femur in Müller's specimen, contrasted with the normal position shown by the dotted line.

of disease or change other than that of the internal structure, according to the altered condition of weight and function.

Shortly after the publication of Müller's paper, Rotter * presented to the Medical Society of Munich a case of bending of both femoral necks in a boy of fifteen. The symptoms were fatigue and pain on exertion, an awkward rolling gait caused by adduction of the limbs, prominent trochanters

* Ein Fall von doppelseitiger rhachitischer Verbiegung des Schenkelhalses. *Münchener klinische Wochenschrift*, Aug. 12, 1890.

elevated above Nélaton's line, and moderate restriction of motion. No evidence of local disease was present.

A specimen of very great deformity of the neck of the femur was obtained by Hoffa * by resection of the joint. The patient, a girl of fourteen, had begun to limp at the age of three years without known cause; shortening of the leg had steadily increased, unaccompanied by any symptoms other than limp and fatigue on exertion. The appearances were somewhat like those of congenital dislocation of the hip—great prominence and elevation of the trochanter to seven centimetres above Nélaton's line; no marked restriction of motion in any direction.

The joint was normal, but there was such depression of the neck of the femur downward and backward that the head of the bone rested on the trochanter minor at an angle of 60° with the shaft as contrasted with the normal of 128° (Fig. 2). Section showed change in structure but no evidence of previous disease.

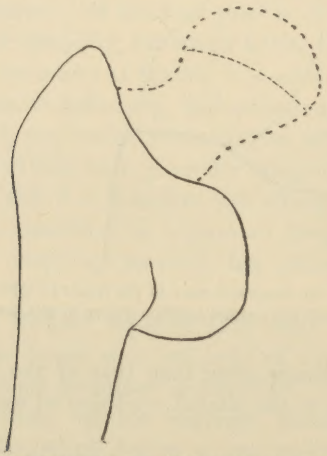

FIG. 2.—Outline of the deformity in Hoffa's specimen. The dotted line shows the normal position.

These cases represent the meager literature of the subject which has apparently attracted no attention in this country up to the present time.

* Zur Casuistik der Verbiegungen des Schenkelhalses von Julius Schultz. *Zeitschrift für orthop. Chir.*, Bd. i, S. 55.

During the past two years four examples of this affection have come under my observation.

I present the histories of the patients, somewhat in detail, with photographs showing the appearances and effect of the deformity, in the hope that one of the obscure affections of the hip joint may be recognized and more effectively treated than under such diagnoses as periostitis, tumor, dislocation, rheumatism, hip disease, or paralysis, as in some of the cases to be reported.

Case I.—A well-nourished boy, fifteen years of age, came to the Hospital for Ruptured and Crippled on June 7, 1892. There was a marked limp on the right side and evident shortening of the leg, for which a high shoe was worn.

One year before, without known cause and without symptoms, a gradually increasing limp was noticed, and in six months it was necessary to apply a cork sole to the shoe to compensate for the shortening of the leg.

On examination, the appearances were those of congenital dislocation of the hip—that is, a very prominent trochanter elevated upward and backward, above Nélaton's line.

The actual shortening, measured from the anterior superior spine to the internal malleolus, was three quarters of an inch. The apparent shortening, measured from the umbilicus, caused by the adduction of the limb was three inches and a half. The position of the foot was normal. There was no limitation of flexion, extension, or rotation of the limb; the movements were free, smooth, and painless. Abduction was absolutely restricted. That the head of the bone was in the acetabulum was shown by its normal motion and because it could not be moved up or down from its position by pressure or traction.

During the two years intervening between the first examination and the present report, the boy has been examined from time to time at his home. The appearances noted at the first examination have become gradually more marked. The actual shortening of the leg had increased an inch in April, 1893, and to an inch and a half in April, 1894; the trochanter has become more and more prominent, until the deformity is as seen in the photograph presented (Fig. 3), which shows the adduction of the leg, the compensatory upward tilting of the pelvis, and the lateral curvature of the spine.

The patient has worked steadily at his occupation of driver of a peddler's cart; he insists that he has never suffered the slightest pain or discomfort, that his ability to walk and run is equal to that of other boys. His relatives and friends have

been carefully questioned, but no variation from the history has been obtained. He was in perfect condition until the age of fourteen years. The limp and shortening began without apparent cause and have increased without symptoms. All treatment has been refused. He denies overwork or injury at any time, and there is no evidence of former or present rhachitis.

Case II.—The patient, a well-nourished boy of sixteen years, came to the hospital in July, 1893. Except for a somewhat exaggerated eversion of the feet and evident flat feet, there was nothing peculiar in his appearance.

In infancy he was said to have had weak ankles, and the flat feet were of indefinite duration, but had never caused pain or discomfort. For about two years he had been working as a grocer's boy, standing and carrying heavy weights. The previous spring he had been troubled with a peculiar soreness and stiffness about the right hip, thought to be growing pain. These symptoms were entirely relieved by a journey to Canada on a canal boat. On his return his usual work was resumed, and soon after the discomfort became again apparent, and had slowly increased during the winter; recently similar symptoms had appeared on the opposite side.

The symptoms complained of at this time were a feeling of fatigue and of pain referred to the right trochanter and to the front of the thigh; a peculiar stiffness about the hip after sitting or remaining long in one position. The symptoms were increased by extra work, diminished by rest; there was at no time pain when at rest.

On examination, the eversion and flatness of the feet were very apparent, there was slight knock-knee, slight hyperextension at the knees. The trochanters appeared slightly elevated above Nélaton's line (Fig. 4) and somewhat forward of their ordinary position. The gait was somewhat rolling in character; the motion at the hip joints was perfectly free in flexion and extension, abduction limited to about a third of normal, rotation inward limited with the feet in the perpendicular line. The restriction was somewhat greater on the right side than on the left, and there was slight atrophy of the muscles of the thigh. The diagnosis of bending of the femoral necks was made; rest, gymnastic exercises, and tonics were advised.

No particular notice appears to have been taken of the diagnosis or advice, for three months later he again appeared at the hospital, at this time able to walk only with much effort, the body swaying from side to side in a very marked and peculiar manner A number of physicians had been consulted in the

meantime, diagnoses varying from hip disease to paralysis having been obtained.

On standing, the prominent trochanters were seen to be markedly elevated above Nélaton's line (Fig. 5), and nearer the median line of the body—that is, although the patient stood with the feet greatly everted, the trochanters were in the position that they should have assumed with the feet inverted. Behind each trochanter there was a deep sulcus; the normal lumbar lordosis was absent; abduction of the legs now limited at the line of the body; flexion of the legs only possible when they were crossed (Fig. 6)—that is, flexion increased the adduction.

Extension of the limbs free; flexion somewhat limited on the right side; no pain or spasm or interference with motion within these limits. Crutches were now ordered.

The patient was again seen at his home four months later, and a final examination was made on May 1, 1894. The adduction had increased so that the patient swung himself along on crutches, the left leg crossed over the opposite. It was only with the greatest effort that the legs could be passed by one another, so that he usually hitched along with one leg behind the other—the so-called scissors walk.* One very noticeable change has taken place: the progress upward of the trochanter on the left side is no longer forward but upward and backward; the pelvis is thus slightly twisted, and, as the weight falls somewhat behind its normal axis, the lumbar lordosis, absent at the first examination, is now well marked. There is a compensatory upward tilting of the pelvis on the left side.

When lying on the back the eversion of the right leg is so great that the outer border of the foot rests on the table. Inward rotation is possible to 45° only. On flexing the right thigh, the leg crosses that of the opposite side, and with the thigh at a right angle with the body the outward rotation is so great that the heel is in the line of the opposite anterior superior spine. The outward rotation is less on the opposite side, but the adduction is about the same—that is, about 15°. With the limbs parallel and extended, separation of the knees to three inches and a half only is possible. Flexion at once crosses them, which explains the peculiar walk. The trochanters are at least an inch and a half above Nélaton's line.

As the patient stands, the broadening of the pelvis and shortening of the legs relative to the body is evident (Figs. 7 and 8). He is in perfect health and has no pain; although he has grown very rapidly during the year, the legs measured from

* Petit. Les jambes en ciseaux. *Cong. français des chir.*, 1892, p. 733.

the anterior superior spines to the internal malleoli are apparently of the same length as at the first examination, the increase in growth being compensated by the upward displacement.

It is believed that the bending of the necks has nearly reached the limit, and it is proposed during the summer to divide the femora below the trochanters so that sufficient abduction may be acquired to make walking possible. The photographs show the condition very well.

Case III.—An overgrown German boy, seventeen years of age, applied at the Vanderbilt Clinic on March 1, 1894. He had for a year been working as a baker; the hours were long, and he was obliged to stand constantly. Within the year he had noticed a bending of the right knee and a peculiar stiffness and pain about the left hip and thigh, most marked on changing from a position of rest to activity, as on rising in the morning or after sitting. Examination showed well-marked knock-knee on the right side (Fig. 9), and at the opposite hip joint restriction of abduction and slight restriction of inward rotation of the leg; slight elevation of the trochanter and approximation toward the median line. The limb was three quarters of an inch longer than its fellow, as measured from the apices of the trochanters to the soles of the feet, so that no actual shortening was apparent. The treatment consisted in absolute cessation of work, regular gymnastic exercises, massage, and stretching of the affected hip and knee. All the pain immediately ceased.

Case IV.—A healthy, well-nourished Italian boy, aged eleven years, came to the hospital on March 20, 1894, saying that he had been sent by his Sunday-school teacher because he limped. This limp was of possibly one year's duration; there was also at times a feeling of stiffness and discomfort about the hip and front of the thigh after long standing and running at his occupation, that of newsboy; no pain when at rest. Examination showed slight limp, slight downward compensatory tilting of the pelvis, elevation of the trochanter to an inch above Nélaton's line, and prominence most marked on flexing the limb. (Fig. 10.) One inch shortening; no adduction; no pain on motion or spasm; slight limitation of inward rotation and of abduction. The symptoms and appearances simulated exactly those of fracture of the neck of the femur with upward displacement. As the boy and his mother, whom I afterward saw, thought the symptoms—that is, the limp and discomfort on exertion—were becoming more marked, it was decided to apply a traction hip splint to temporarily relieve the weakened bone from strain and pressure. This, combined with massage and exercises, relieved the symptoms at once.

As photographs are presented of all the cases a more detailed description is perhaps unnecessary, nor have the various measurements been given, as it is thought that such details are of more importance in arriving at the diagnosis than of interest to the readers of the communication.

There is certainly a marked difference in the cases: Cases II and III show evidence of the weakness of adolescence in deformity of other joints and present also an exciting cause in the occupation.

In the first case no other joint is affected nor is there evidence of general weakness or exciting cause; although the deformity is greater than in the three other cases, the patient denies pain or discomfort.

From the clinical symptoms it would appear that the progress of the bending of the neck of the femur is comparatively rapid until the resistance of the compressed bone is sufficient to oppose further increase of the deformity, or until the head of the bone rests upon the trochanter minor, as in Hoffa's specimen.

Apparently the head of the bone is usually depressed downward and backward in the line of the least resistance; the femur is thus rotated outward, which explains the eversion of the feet; the trochanter elevated and pushed nearer to the median line of the body. Its prominence is explained by the elevation and by the change in the angle of the neck.

The limitation of abduction of the limb is explained by the pressure of the neck upon the upper border of the acetabulum, of the trochanter on its upper and posterior rim, and by the pressure of the lower border of the depressed head upon the lower portion of the capsule (Fig. 11). In other words, with the legs in apposition, the deformed neck is in the relation to the acetabulum that is normal in extreme abduction of the limbs. Flexion of the limb increases the deformity, as may be explained by the shape and position of the acetabulum; its upper and posterior margin being more prominent, it interferes with the prominent trochanter, so that adduction is increased and the tissues are markedly distended by the projecting bone; thus the assumption of the sitting posture is often

painful, or rather the change from the erect to the sitting posture. This symptom was complained of in the cases of fracture of the neck of the femur in young children which I

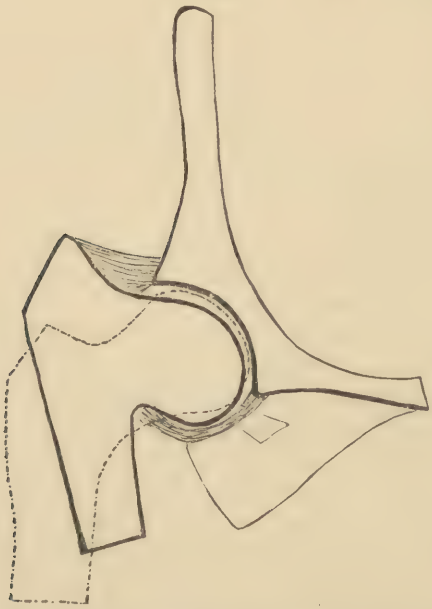

FIG. 11.—Cross section of the pelvis and the deformed femur. A scheme to show the effect of the deformity in limiting abduction of the limb. The dotted outline shows the normal relation.

have reported,* in whom the deformity and clinical appearances were very similar to a slight degree of this deformity. If the deformity is of one side only, the symptoms are simply stiffness and limp from the shortening, increased by the adduction of the limb, which causes the compensatory upward tilting of the pelvis. If on both sides, the adduction of the limbs causes the peculiar rolling gait because of the interference of the knees. The deformity of one side may cause merely an awkwardness and limp, but on both sides it may disable the patient.

The character of the pain is similar to that noticed in developing knock-knee and bowlegs of adolescence. The

* Fracture of the Neck of the Femur in Childhood. *Medical Record*, February 25, 1893.

awkwardness and weakness are sufficiently explained by the changed relations of the joint surfaces and of the muscles and ligaments attached to the femur. If the leg is greatly adducted as the result of the depression of the neck of the femur, the conditions are favorable to a gradual upward enlargement of the acetabulum, and it is possible that the final result in as extreme a case as No. 1 may be a partial dislocation from the acetabulum.

Although Müller was the first to call attention to the clinical significance of this affection the deformity itself has been described by several others. Röser in 1843 * described a specimen obtained from a subject who died at the age of twenty-four years. During life the limb had been so adducted and flexed as the result of inflammatory disease in the neighborhood of the joint that it had never been used, and was supposed to be a deformity caused by spontaneous dislocation from hip disease. Section showed the joint surfaces normal and the head of the bone in the acetabulum, the neck being greatly distorted downward and forward.

Zeis, in 1851,† described a museum specimen of distortion of the neck of the femur downward and forward, and in this case also section showed no disease.

A very perfect illustration of downward distortion of the neck of the femur to forty-five degrees may be seen in the *Transactions of the Philadelphia Pathological Society* for 1857,‡ obtained from a subject in a dissecting room. Before removal the deformity was supposed to be the result of fracture. Section showed no evidence of previous injury or disease. The opposite femur was deformed in a similar manner though to a less degree.

Another familiar example of change in the angle and position of the neck of the femur is that of congenital dislocation.

In each of the five instances in which I have had an opportunity to examine the neck of the bone during the

* Schmidt's *Jahrbücher*, 5. Supplementband. Leipsic, 1843, p. 257.

† *Beiträge zur pathologischen Anatomie und zur Pathologie des Hüftgelenks*, No. 1.

‡ Richardson. Deformity of the Neck of the Thigh Bone simulating Fracture with Ossific Union.

operation for its replacement after the method of Hoffa it was depressed to a right angle with the shaft, and in one case markedly displaced forward.

Specimens show depression of the neck as the result of fracture and of local disease, as in osteomyelitis,* osteitis, or necrosis, and one case of very great deformity of both femoral necks somewhat resembling in clinical history Case II was described and illustrated by Monks, † of Boston, in 1886. Although the patient, a boy of eighteen years, suffered from knock-knee and flat feet in addition to deformity at the hip joint, it did not occur to the author, nor to the gentlemen who discussed the case, to include the deformities under one general cause. Dr. Monks was obliged to make the evidently unsatisfactory diagnosis of arthritis deformans to explain the peculiar deformity at the hip. A case somewhat similar in history and appearance to that of depression of the neck of the femur has been reported and illustrated by C. B. Keetley, ‡ of London, to whom I am indebted for the original manuscript and photographs of the case. The patient, a girl of twenty, was admitted to the West End Hospital in March, 1888, for a limp and marked prominence about the right trochanter. The duration of the deformity was about eight years; she had been treated at various hospitals from time to time under diagnoses of dislocation, periostitis, tumor, and the like. Keetley regarded the case as unique and called Sir James Paget in consultation, who did not make a diagnosis but advised observation.

Later, Keetley made a diagnosis of local rhachitic disease with bending of the femur in the trochanteric region, because of the slow progress of the disease and the development of a rotary curvature of the spine. As the disability was caused principally by adduction of the limb Keetley removed a cuneiform section of the bone below the trochanter and by division of the adductors brought the limb into

* Oberst. Ueber Knochenverbiegungen bei akuter Osteomyelitis. *Münch. med. Woch.*, 1890, v, 13.

† G. H. Monks. A Case of Unusual Deformity of both Hip Joints. *Bost. Med. and Surg. Jour.*, Nov. 18, 1886.

‡ Keetley. A Case of Rhachitis Adolescentium, etc. *Ill. Med. News*, London, vol. i, No. 7.

good position with subsequent great improvement in the posture and gait. The subsequent history is not given. The wedge of bone removed at the operation showed evidence of local rhachitis.

Bending of the neck of the femur may be one of the deformities of osteomalacia, osteitis deformans, and finally, as the result of the very much more common disease, rhachitis.

Lauenstein * obtained specimens of downward bending of both femoral necks from a child of six years, who died shortly after the rectification by osteotomy of other rhachitic deformities of the lower extremity. This peculiarity had not been suspected during life. He afterward examined several adult skeletons deformed by rickets and in one found very great distortion of the femoral necks, the trochanters being in such close proximity to the rim of the acetabulum that slight motion only could have been possible during life.

Nélaton † called attention to the occasional elevation of the trochanters in rhachitic children. I have examined a large number of rhachitic children with reference to this point.

The elevation of the trochanters, when present, is usually either apparent, due to the abduction of the limbs, as in bowlegs, or in other instances seems to be caused rather by an outward bending of the upper part of the shaft than by change in the angle of the neck. In one case, a child of two years, suffering from a mild degree of rhachitis, elevation from bending of the necks appeared to be present, and there was in addition the characteristic limitation of abduction of the thighs, a symptom absent in the other children examined. The legs were nearly straight; the principal symptom, according to the mother, was the difficulty experienced by the child in getting on its feet from the sitting posture.

It is evident, however, that this deformity in early childhood is a rare one compared with the other deformities of rhachitis, probably because the neck of the femur is

* C. Lauenstein. Bemerkungen zu dem Neigungswinkel des Schenkelhalses. *Archiv für klin. Chir.*, Bd. xl, S. 244.

† Art. Rachitisme. *Nouv. dict. de med. et de chir.*, vol. xxx, p. 382.

so short and comparatively large that bending to the extent of producing noticeable and characteristic symptoms is hardly possible.

The question of ætiology of the deformity is naturally of importance in its influence on the treatment to be pursued. Müller thought that a local form of late rickets would best explain the weakness of the bone, and this view is supported by Lauenstein.

The term "late rickets" is a misleading one, because it is applied by Clutton,* Drewitt,† and others to a general disease identical with infantile rickets that may appear in later life, as shown by cases and specimens obtained.

Local rhachitis, in the sense used by Müller and others, has none of the characteristics of ordinary rhachitis, either in symptoms or in the appearance of the specimens.

Mikulicz, it is true, supported the theory of local rhachitis as the cause of similar deformities at the knee joint by the broadening of the epiphyseal cartilage, a condition which Trippier asserts is normal at a period of rapid growth.

As there is at present no direct evidence of local rhachitis, it may be well to call attention to other possible predisposing causes for this deformity; for example, relative slenderness and weakness of the bones, to which attention has been called by Mikulicz,‡ Arndt,# and Humphrey;‖ to the variation in the angle of the neck of the femur between 110° and 140° in the specimens examined by Humphrey and Mikulicz;△ also in its direction. Usually it projects forward from the shaft at an angle of 12°, but in certain

* Clutton. Late Rickets. *St. Thomas's Hospital Reports*, 1884, p. 105.

† Drewitt. A Case of Late Rickets. *Trans. Lond. Path. Society*, vol. xxxii, p. 387, 1881.

‡ Mikulicz. Die seitlichen Verkrümmungen am Knie, etc. *Archiv für klin. Chir.*, Bd. xxiii, S. 561.

Arndt. Pes Valgus, Pes Varus, und das biologische Grundgesetz. *Wiener med. Presse*, April 6, 1890.

‖ Humphrey. The Angle of the Neck with the Shaft of the Femur at Different Periods of Life and under Different Circumstances. *Journal of Anat. and Phys.*, vol. xxiii, 1889, p. 236.

△ Mikulicz. Ueber individuelle Formdifferenzen am Femur. *Archiv für Anat. und Phys.*, Anat. Abth., 1878, S. 364.

specimens this was increased to 20°, and in one it projected backward at an angle of 25° with the shaft.

Some of these peculiarities I have noticed in the dissecting room of the College of Physicians and Surgeons, especially the variation in the size and apparent strength of the neck in bodies of corresponding size.

Humphrey * asserts that there is not, as is usually supposed, a gradual sinking of the neck from childhood to old age, but that the descent is terminated in adolescence. This statement is supported by the observations of Lane.† If it is true that a certain amount of depression of the femoral neck is normal during adolescence, it seems reasonable that this may become exaggerated to deformity in individuals presenting possibly peculiarities in the shape, size, or position of the bone, or in those subjected to some of the other predisposing causes which have been mentioned. It is possible also that injury, as suggested by Müller, or sudden overexertion, as in a case reported by Mosetig, may in certain instances serve as the exciting cause of the deformity. Although rhachitis is responsible for most of the extreme deformities of childhood, yet it is a matter of common knowledge that bowleg is not at all uncommon in children who do not show a trace of disease —who are, in fact, exceptionally active, standing and walking at an early age—the bending of the bone being in such cases the effect of over-weight.

It is, however, not the object of this paper to deny the possibility of rhachitis as the cause of this affection, but rather to place this particular deformity in the same class with the knock-knee and bowleg of adolescence.

The treatment, aside from that of the general condition, will be: 1. To remove the exciting cause—that is, overwork. It may be in some cases that simple cessation of the occupation will be sufficient; in others, and particularly the one-sided deformity, the long traction hip splint, if the patient will permit, would seem to be indicated.

2. Local massage, exercises, and manipulation and passive motion in the direction of the restricted motion, on

* *Loc. cit.*

† Arbuthnot Lane. Senile Changes in the Human Subject. *Trans. Lond. Path. Society*, 1886, p. 446.

the principle of manipulation in the treatment of similar deformities of the knee and foot.

3. In the advanced cases osteotomy below the trochanter, on the principle followed in deformities at the knee, because the disability is caused by the adduction of the legs more than by actual shortening. By osteotomy, with consolidation, with the legs widely separated, one may, to a certain extent, replace the head of the bone in a relatively proper position and relieve the extreme outward rotation. The diagnosis of the affection does not offer any particular difficulties at the stage in which patients usually present themselves.

Marked prominence and elevations of the trochanter above Nélaton's line can be caused only by these conditions:

1. Displacement of the head of the bone from the acetabulum.

2. Change in the angle of the neck of the femur.

3. By upward enlargement or "wandering" of the acetabulum.

Dislocation may be congenital, in which case the patient limps from the moment that he begins to walk. It may be the result of traumatism, in which case the deformity and disability are instantaneous.

It may be the result of sudden distention and rupture of the capsule by serous effusion, as in rheumatism; or by pus, as in acute arthritis or hip disease.

All these conditions may be excluded by the history.

In the absence of any history, the differential diagnosis between dislocation and bending of the neck of the femur is easily made.

In all cases of dislocation of the femur upward, if the thigh is flexed and adducted to its extreme limit, the neck of the displaced bone can be traced upward and the head of the femur made out, moving beneath the distended soft parts when the thigh is rotated. In bending of the neck of the femur nothing but the prominent trochanter can be felt. In all cases of congenital dislocation a certain amount of upward and downward motion may be obtained by pressure and traction of the limb; in bending of the neck this is impossible.

The neck of the bone may be depressed as the result of fracture, in which case there is a history of injury. It may be distorted by local disease—as osteomyelitis, osteitis, or necrosis—when there must be the evident signs of local disease, such as pain, swelling, suppuration, and constitutional depression. It may be depressed as one of the deformities of a general disease, such as osteitis deformans, osteomalacia, or general rhachitis. It is then but one of a series of deformities, and does not call for special comment.

Wandering of the acetabulum has only been observed after long-continued deformity and spasm of muscles, the result of confirmed hip disease, and the condition may therefore be excluded on the same grounds. It is evident that the only difficulty in diagnosis must arise at a very early stage of the affection from mild forms of rheumatism or hip disease. It is probable, however, that the progress of the deformity is coincident with the symptoms, thus differing from rheumatism, in which there is no elevation of the trochanter; and hip disease, in which elevation of the trochanter is a late symptom, occurring long after the diagnosis has been made.

In bending of the neck of the femur there is no local swelling or infiltration; the limitation of motion is in abduction and inward rotation; other motions are at this stage unlimited. In hip disease or rheumatism, when limitation occurs, it is in all directions, and accompanied by muscular spasm, which is absent in this affection.

The character of the symptoms, discomfort, stiffness, and pain about the trochanter and front of the thigh, increased by work and absent when at rest, is very different from the neuralgic pain of hip disease, while chronic rheumatism in a young person, confined to one joint, must be a very rare affection.

Prognosis.—Unchecked, the deformity shows a marked tendency to increase, as illustrated by Cases I and II. Judging from Müller's three cases, the pain, disability, and limitation slowly increase for a time; then the pain ceases, and the disability caused by shortening and restriction of motion remains, but does not prevent the patient from following his ordinary pursuits.

Doubtless early diagnosis and treatment will, in patients willing or able to follow advice, prevent the further increase of the deformity. Osteotomy, I am sure, will remove the more serious disability, although it can not be as effective as in the other deformities of the lower extremity.